

Gastrointestinal oncology diagnosis based on imaging fractal analysis. Preliminary results

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Paper describes novel mathematical algorithms that can expand the information content of medical images, providing an objective measurement to reduce subjectivity in the perception and interpretation [1, 2]. Fractal Dimension (FD) is a statistical quantity that gives an indication of how completely a fractal appears to fill space, zooming down to more finer scales. We proposed a method of medical images analysis obtained from a wide range of sources — radiology imaging, ultrasound, endoscopy. We calculated the FD for 5 patients with colorectal cancer for ultrasound, CT images (metastases evaluation) and vector models generated from endoscopy data (processing of colon tumor). Mean FD was 1.68 for liver lesions; 1.65–1.72 for complex colon tumors; and 1.15–1.32 for polipiod lesions. Thus fractal analysis of medical images is a promising non-invasive sophisticated approach, it should become highly informative indicator of pathological formations using nonlinear mathematical parameters of structure, gives insights into tumor morphology and can become a useful tool for analyzing tumor growth patterns for diagnosis, staging and treatment follow up. Further studies on large patients cohorts are required assessing different pathological processes to establish scientifically valid standards.

[1] Bubnov R. V., Melnyk I. M. *Lik. Sprava* **3-4**, (2011), p.108–113.

[2] Bubnov R. V., Melnyk I. M. *Journal of Hepatology* **58**, (2013), 258–259.